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(54) FLEXIBLE PRINTED BOARD AND LAMINATED BOARD THEREFOR

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a laminated board for a flexible printed board which is suitable for forming fine patterns and has superior reliability, particularly superior migration-resistant properties and electrical properties such as electrical insulation properties, etc.

SOLUTION: This laminated board for a flexible printed board comprises a flexible insulation film and a copper foil which is bonded to at least one side of the flexible insulation film with an adhesive layer in-between. The thermal linear expansion coefficient of the flexible insulation film is 10-20 ppm/°C, the thickness of the adhesive layer is 1-15 μm, the thickness of the copper foil is 3-12 μm, and the surface roughness Rz of the M surface of the copper foil is 0.5-3.0 μm.

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CLAIMS

[Claim(s)]
[Claim 1] The laminate for flexible printed circuit boards characterized by being the laminate for flexible printed circuit boards with which the laminating of the copper foil was carried out to at least one side of a flexible insulation film through the adhesives layer, the heat ray expansion coefficient of this flexible insulation film being 10-20 ppm/degree C, the thickness of an adhesives layer being 1-15 micrometers, and the thickness of copper foil being 3-12 micrometers, and the surface roughness Rz which is the Mth page of copper foil being 0.5-3.0 micrometers.
[Claim 2] The laminate for FURESHI kibble printed circuit boards according to claim 1 characterized by a flexible insulation film being a polyimide film.
[Claim 3] The laminate for flexible printed circuit boards according to claim 1 or 2 characterized by the modulus of elasticity in 150 degrees C of the adhesives used for an adhesives layer being 5 or more MPas.
[Claim 4] The flexible printed circuit board to which it is the flexible printed circuit board which prepared the pattern in copper foil using the laminate for flexible printed circuit boards according to claim 1 to 3, and the initial value R0 of the insulation resistance of this pattern when carrying out continuation impression of DC100V under the environment of 85 degrees C and 85%RH and the insulation resistance value R1000 after 1000hr are characterized by filling R0>108ohm and R1000/R0>0.8.
[Claim 5] The flexible printed circuit board according to claim 4 which a pattern tears off, and the plating pattern after strength's being 5 or more N/cm and giving one or more sorts of non-electrolyzed tinning, non-electrolyzed gold plate, and electrolysis gold plate to this pattern tears off, and is characterized by strength being 4 or more N/cm.
[Claim 6] The flexible printed circuit board according to claim 4 or 5 characterized by furthermore connecting IC chip with the pressure-welding paste and/or the pressure-welding film.
[Claim 7] The flexible printed circuit board according to claim 4 or 5 characterized by furthermore connecting IC chip by metal eutectic bonding by the ultrasonic bonder.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] Through adhesives, about an insulating film and the laminate for flexible printed circuit boards which comes to laminate copper foil, this invention is suitable for especially formation of a detailed pattern, and relates to dependability and the laminate for flexible printed circuit boards which was especially excellent in electrical properties, such as migration-proof and electric insulation.
[0002]
[Description of the Prior Art] The flexible printed circuit board serves as an existence indispensable as internal wiring and the element-placement substrate of a device with progress of the formation of small lightweight of electronic equipment, and thin-shape-izing. Two-layer CCL (Copper Clad Laminate) which consists of only polyimide and copper foil without adhesives as an ingredient configuration of a flexible printed circuit board is known, direct copper is formed in a polyimide film by plating, and the thing of the type which applies a polyimide varnish to copper foil is known. Especially since two-layer CCL does not mind adhesives, it is excellent in the dependability at the time of an elevated temperature, and it is used focusing on the particular application taking advantage of the property. Moreover, three-layer CCL which consists of a polyimide film / adhesives / copper foil, such as Kapton, is known, and it is mainly used for the general-purpose application. Among these, properties, such as an adhesive property, electric insulation, chemical resistance, and solder thermal resistance, are required of adhesives, and things, such as a polyamide (nylon) / epoxy system, polyester / epoxy system, a phenol / butyral system, nitrile rubber / epoxy system, acrylic, an urethane system, and a polyimide system, are used as adhesives which fill these demands.
[0003] When the adhesion of resin and a flexible substrate was taken into consideration, three-layer CCL with it was advantageous. [more desirable and three layer CCL through adhesives and] [cheap from the field of cost]
[0004]
[Problem(s) to be Solved by the Invention] However, improvement in the dependability accompanying the formation of a fine pitch of a pattern and the flexible printed circuit board which was especially excellent in electrical properties, such as migration-proof and electric insulation, were called for, and the present condition was being unable to respond to these in conventional three-layer CCL.
[0005] In view of this situation, this invention is suitable for formation of a detailed pattern, and aims at offer of dependability and the laminate for flexible printed circuit boards which was especially excellent in electrical properties, such as migration-proof and electric insulation.
[0006]
[Means for Solving the Problem] That is, this invention is a laminate for flexible printed circuit boards characterized by being the laminate for flexible printed circuit boards with which the laminating of the copper foil was carried out to at least one side of a flexible insulation film through the adhesives layer, the heat ray expansion coefficient of this flexible insulation film being 10-20 ppm/degree C, the thickness of an adhesives layer being 1-15 micrometers, and the thickness of copper foil being 3-12 micrometers, and the surface roughness Rz which is the Mth page of copper foil being 0.5-3.0 micrometers. Moreover, it is the flexible printed circuit board which prepared the pattern in copper foil using this laminate for flexible printed circuit boards, and the initial value R0 of the insulation resistance of this pattern when carrying out continuation impression of DC100V under the environment of 85 degrees C and 85%RH and the insulation resistance value R1000 after 1000hr are the flexible printed circuit boards characterized by filling R0>108ohm and R1000/R0>0.8.

[0007]
[Embodiment of the Invention] This invention is explained to a detail below.
[0008] The laminate for flexible printed circuit boards of this invention has the structure which comes to carry out the laminating unification of the copper foil through an adhesives layer at least on one side of a flexible insulation film. Usually, although used with 3 tub structures where copper foil was prepared only in one side, copper foil may be prepared in both sides of a film if needed.
[0009] Although there are "Kapton" (Du Pont-Toray, Inc.), "APIKARU" (Kaneka Co., Ltd.), the polyimide film represented by "YUPI REXX" (Ube Industries, Ltd.), a polyethylene terephthalate film, a polyphenylene sulfide film, an aramid film, a liquid crystal polymer film, etc. as a film which has the flexibility and the insulation which are first used by this invention, a polyimide film is preferably used from thermal resistance or a fire-resistant point. If needed, the flexible insulation film used for this invention can perform surface treatment, such as corona-discharge-treatment, low-temperature plasma treatment, physical surface roughening, and easily-adhesive coating, and can also be used.
[0010] The heat ray expansion coefficient of the flexible insulation film used for this invention needs to use a 10-20 ppm [/degree C] thing. The polyimide film which has this heat ray expansion coefficient especially is used preferably.
[0011] In case copper foil and a layered product are formed at degree C in less than 10 ppm /, if a heat ray expansion coefficient is larger than degree C in 20 ppm /, it will be hard coming to become easy to produce curvature, and to secure accumulation dimensional accuracy at the point referred to as making small thermal expansion at the time of an elevated temperature, although a heat ray expansion coefficient is so good that it is small again. Therefore, the dimensional accuracy of a film can be raised with sufficient balance by using the film of the heat ray expansion coefficient of the above-mentioned range.
[0012] Film thickness is 10-50 micrometers preferably. The bending nature at the time of incorporating, if film thickness is too thick is spoiled, and conveyance and positioning will become difficult if film thickness is too thin. It is desirable to use the film of 25-38-micrometer thickness in the case of the COF (chip-on FREX or chip-on film) application which performs pattern processing and IC mounting with the TAB (tape automation TEDDO bonding) tape line which performs conveyance and positioning by the sprocket hole. Moreover, when using a thin film, after performing the carrier tape for reinforcement even for lamination, pattern processing, or mounting of IC at the rear face of a copper-clad laminate, the approach of removing a carrier tape may be used.
[0013] Although copper foil is preferably used also with rolling copper foil or electrolytic copper foil, for detailed pattern formation, the thickness of copper foil needs to be the range of 3-12 micrometers, and uses a 4-10-micrometer thing preferably. Furthermore, generally, although roughening processing of the field by the side of the lamination of copper foil (Mth page) is carried out in order to obtain adhesive strength, the granularity Rz needs to be 0.5-3.0 micrometers, and is 0.6-2.5 micrometers preferably. If Rz exceeds 3.0 micrometers, after carrying out pattern formation by etching, copper foil remains between patterns and it is not suitable for detailed pattern formation. Moreover, since adhesive strength with Rz sufficient by less than 0.5 micrometers is not obtained, it is not desirable. As such thin and small copper foil of Mth page surface roughness, ultra-thin rolling copper foil (Japan Energy and Fukuda Metal Foil & Powder, Inc.), WS foil (the Furukawa Electric Co., Ltd.), TQ-VLP (Mitsui Mining and Smelting Co., Ltd.), etc. are marketed, for example.
[0014] Although especially the adhesives for sticking a flexible insulation film and copper foil are not limited, what has chemical resistance is used preferably. For example, a polyamide, an epoxy resin, phenol resin, the resin containing one or more sorts chosen from acrylic rubber, etc. are used preferably.
[0015] The thickness of an adhesives layer needs to be 1-15 micrometers, and is 2-10 micrometers preferably. If it is the thickness (it enters into irregularity completely) which covers the Mth page irregularity of copper foil, the thinner one of the thickness of an adhesives layer is good. however, thickness of an adhesives layer not only being unable to finishing burying irregularity of the Mth page of copper foil by less than 1 micrometer but a conductor -- since a conductor pattern is buried with the heat and pressure in the case of connection by a pressure-welding film etc. or there is a possibility of shifting when ****** carries out, and it falls also strength and 15 micrometers is exceeded, it is not desirable.
[0016] Moreover, it sets for the COF application by the approach using a pressure-welding paste or a pressure-welding film, or the low-temperature metal conjugation method by the ultrasonic bonder etc., and the reinforcement of the adhesives at the time of component mounting (about 150-200 degrees C) is required. Five or more MPas are 50 or more MPas still more preferably 20 or more MPas more preferably preferably as an elastic modulus of the adhesives in 150 degrees C. A circuit pattern is buried with less than

5 MPas with the pressure at the time of junction, or an elastic modulus becomes easy to produce gap.
[0017] The flexible printed circuit board of this invention is a flexible printed circuit board which prepared the pattern in copper foil using the laminate for flexible printed circuit boards mentioned above, and the initial value R0 of the insulation resistance of this pattern when carrying out continuation impression of DC100V under the environment of 85 degrees C and 85%RH and the insulation resistance value R1000 after 1000hr are characterized by filling R0>108ohm and R1000/R0>0.8. R0 [1x109ohms or more] is 2x109ohms or more more preferably.
[0018] The formation approach of a pattern can use well-known approaches, such as a subtractive process.
[0019] the conductor of a pattern -- although the between tooth space is arbitrary, from the meaning of this invention, it is 5-200 micrometers preferably, and 10-100 micrometers is 15-50 micrometers still more preferably more preferably.
[0020] Moreover, a pattern tears off, the plating pattern after strength's being 5 or more N/cm and giving one or more sorts of non-electrolyzed tinning, non-electrolyzed gold plate, and electrolysis gold plate to this pattern tears off, and it is desirable that strength is 4 or more N/cm.
[0021] Moreover, as chemical resistance about a pattern adhesive property, 2mm width-of-face pattern is used, and it is JIS. It is desirable that 90-degree exfoliation strength after the chemical (2 N-HCl, 2 N-NaOH, 2-propanol) dipping processing set to C-6471 is 4 or more N/cm.
[0022] Although the laminate for flexible printed circuit boards of this invention is manufactured, for example by the following approaches, it is not limited to this. That is, on insulating plastic film or copper foil, by approaches, such as a roll coater, an adhesives solution is applied so that it may become uniform thickness, and after drying and removing a solvent, copper foil or plastic film is stuck by the heating laminating method, putting a pressure with the lamination roll heated at 60-150 degrees C. Then, it heats at the temperature of 80-180 degrees C for 1 to 30 hours, heat hardening of the adhesives is carried out, and it considers as a copper-clad laminate. The roll-to-roll method held by the shape of a roll or the approach of performing by the shape of a sheet is sufficient as the method of processing in that case. Moreover, after creating the adhesives film which stuck the film or surface-preparation paper which has easy-releasability beforehand on both sides and carrying out the imprint lamination of it on plastic film or copper foil, the approach of carrying out heating sticking by pressure and sticking copper foil or plastic film etc. can be used.
[0023] After pattern formation, although not limited, after especially the method of obtaining a flexible printed circuit board using the laminate for flexible printed circuit boards performs cover-lay lamination or solder resist spreading, it performs terminal surface preparation, such as plating, and usually serves as a flexible printed circuit board.
[0024] Although not limited especially about the approach of connecting IC chip to a flexible printed circuit board further, one approach of the degrees is used preferably. That is, either the approach of connecting IC chip with a pressure-welding paste and/or a pressure-welding film or the approach of connecting by metal eutectic bonding by the ultrasonic bonder is used preferably.
[0025]
[Example] Hereafter, although an example explains the effectiveness of this invention concretely, this invention is not limited to these examples. First, the evaluation approach used for the example is indicated.
[0026] (1) The curvature laminate was cut 150mmx150mm in the shape of a sheet, and it was left under the 23-degree-C55% environment for 48 hours. The sample was occurred in the flat field, the height of four angles was measured, and the average and maximum estimated. in addition, an evaluation result -- as a judgment result -- fitness (O) -- good (**) and a defect (x) described a little. O ** is usable level.
[0027] (2) After cutting an etching nature laminate into predetermined width of face and applying a liquefied photoresist by the spin coater, the resist pattern was created by exposure development using the glass mask which has the Kushigata pattern shown in drawing 1 . Then, pattern formation was carried out on condition that predetermined (spray) with the etching reagent which uses ferric chloride as a principal component. 20 patterns were formed and the number of excellent articles which was able to carry out pattern formation satisfactory was counted. 0% of percent defectives is success level.
[0028] (3) the Kushigata pattern shown in electric insulation and migration-proof nature evaluation drawing 1 -- etching -- creating -- the constant temperature of 85-degree-C85%RH -- it supplied to the constant humidity inside of a plane, and was left for 24 hours. The electrical potential difference of after that DC100V was applied, and the initial resistance R0 was measured. The continuation mark load of DC100V was succeedingly carried out under this environment, and monitoring of the resistance was carried out continuously. The resistance of 1000 hours after was set to R1000. In addition, as shown in drawing 1 , both

pattern width of face and the tooth space between lines measured as 30 micrometers.
[0029] (4) pattern ****** -- carrying out -- strength -- a pattern with a line breadth of 2mm -- etching -- creating -- JIS the conductor set to C-6471 -- ****** carried out, 90 degrees was torn off according to the measuring method in strength, and strength was measured. Measurement was pulled using tensilon (UTM-4-100, cage en tech corporation), and was performed by part for 50mm/in rate. Furthermore, non-electrolyzed tinning liquid (the SHIPUREI Far East, TT-34) performed 70-degree-C processing for 3 minutes for this pattern, tinning processing was performed, 90 degrees was similarly torn off after plating, and strength was measured. Furthermore, it is JIS about this pattern. C-64711995 After performing a chemical (2N-HCl, 2 N-NaOH, 2-propanol) by the technique set to 8.1.5, 90 degrees was torn off similarly and strength was measured.
[0030] (5) Rate JIS of a dimensional change C-64711995 According to the technique set to 9.6.3, the rate of a dimensional change after etching and heat-treatment (150 degrees C, 30 minutes) was measured.
[0031] (6) The test pattern for COF connection was created using the ACF junction nature laminate, and junction in IC was performed in the ACF junction bonder using the pattern. 20 IC connection was made, the depression by subduction by the adhesives layer of a location gap and a lead pattern etc. was observed, the yes-no decision was performed, and it asked for the percent defective. 0% of percent defectives is success level.
[0032] (7) The test pattern for COF connection was created using the ultrasonic bonder junction nature laminate, and nickel/gold plate was performed to the connection pattern section with IC. Connection with Test IC was made using the pattern in the ultrasonic-jointing bonder (test machine by the east rain zinnia ring company). 20 IC connection was made on the tool temperature of 200 degrees C, 30g of loads and a bump, and the conditions for time amount 1 second, share reinforcement was measured, the location gap, the depression by subduction by the adhesives layer of a lead pattern, etc. were observed further, the yes-no decision was performed, and it asked for the percent defective. 0% of percent defectives is success level.
[0033] Next, the adhesives used for the example and the example of a comparison are described. The adhesives shown below were used.
(1) What was made into 25% of solid content concentration using chlorobenzene and isopropyl alcohol mixed liquor by using adhesives 1 polyamide resin (Uniqema "PRIADIT"2053, 100 weight sections), the bisphenol A mold epoxy resin (the product made from Japan Epoxy Resin "Epicoat" L2832, 40 weight sections), and alkylphenol resin ("REJITOPPU" PS 2780 by Gun-ei Chemical Industry Co., Ltd. and PSM4326, 80 weight sections) as a solvent.
(2) adhesives 2 polyamide resin (Uniqema "PRIADIT"2053 and Fuji -- formation -- "toe MAIDO" TXM-67made from Industry B --) The 50 weight each sections, a pentadiene mold epoxy resin (Tohto Kasei Co., Ltd. make "EPO TOTO" YDDP- 100, 40 weight sections), And the thing made into 25% of solid content concentration using chlorobenzene and isopropyl alcohol mixed liquor by using alkylphenol resin (Showa High Polymer Co., Ltd. make "show Norian" CKM908, 90 weight sections) as a solvent.
(3) What was made into 30% of solid content concentration using methyl isobutyl ketone by using adhesives 3 carboxylation nitrile rubber (product made from JSR PNR-1H, the 100 weight sections), the bisphenol A mold epoxy resin (the product made from Japan Epoxy Resin "Epicoat" Ep834, 30 weight sections), a tetrabromobisphenol A mold epoxy resin (the product made from Japan Epoxy Resin "Epicoat" Ep5050, 80 weight sections), and an aluminum-hydroxide particle (70 weight sections) as a solvent.
[0034] It applied by the roll coater so that the thickness after drying adhesives 1 might be set to 10 micrometers at polyimide film" YUPI REXX S" (the Ube Industries, Ltd. make, heat ray expansion coefficient of 11-12 ppm/degree C) of the thickness of 125 micrometers of examples, and copper foil "TQ-VLP" (the Mitsui Mining and Smelting Co., Ltd. make, M page granularity Rz=2.3micrometer) with a thickness of 9 micrometers was made to rival with a roll laminator. After-cure was carried out in oven after that, and the copper-clad laminate was created.
[0035] It carried out like the example 1 except having made example 2 base film into polyimide film" Kapton EN" (the Du Pont-Toray make, heat ray expansion coefficient of 15-16 ppm/degree C) with a thickness of 38 micrometers.
[0036] It carried out like the example 1 except having used example 3 adhesives as adhesives 2.
[0037] It carried out like the example 1 except having made example 4 copper foil into rolling copper foil"BHY-22BT" (Japan Energy Make, M page granularity Rz=0.67micrometer) of 12-micrometer thickness.
[0038] It carried out like the example 1 except having set example 5 adhesives thickness to 5 micrometers, and having considered as copper foil"F2-WS" (the Furukawa Electric Co., Ltd. make, M page granularity

Rz=2.1micrometer) of 12-micrometer thickness.
[0039] It applied by the roll coater so that the thickness after drying adhesives 1 might be set to 5 micrometers at polyimide film" Kapton EN" (the Du Pont-Toray make, heat ray expansion coefficient of 15-17 ppm/degree C) of the thickness of 612.5 micrometers of examples, and copper foil"F1-WS" (the Furukawa Electric Co., Ltd. make, M page granularity Rz=1.9micrometer) of 12-micrometer thickness was made to rival with a roll laminator. After-cure was carried out in oven after that, and the copper-clad laminate was created.
[0040] It carried out like the example 1 except setting thickness of example of comparison 1 adhesives to 18 micrometers.
[0041] It carried out like the example 1 except making example of comparison 2 copper foil into "3 EC-III" (the Mitsui Mining and Smelting Co., Ltd. make, M page granularity Rz=4.5micrometer) of 12-micrometer thickness.
[0042] It applied by the roll coater so that the thickness after drying adhesives 3 might be set to 10 micrometers at polyimide film" Kapton V" (the Du Pont-Toray make, heat ray expansion coefficient of 25-28 ppm/degree C) of the thickness of 325 micrometers of examples of a comparison, and copper foil "JTC-AM" (Japan Energy Make, M page granularity Rz=2.5micrometer) with a thickness of 9 micrometers was made to rival with a roll laminator. After-cure was carried out in oven after that, and the copper-clad laminate for flexible printed circuit boards was obtained.
[0043] It applied by the roll coater so that the thickness after drying adhesives 1 might be set to 10 micrometers at polyimide film" YUPI REXX S" (heat ray expansion coefficient of 11-12 ppm/degree C) of the thickness of 425 micrometers of examples of a comparison, and copper foil"3EC-III" (M page granularity Rz=5micrometer, Mitsui Mining and Smelting) with a thickness of 18 micrometers was made to rival with a roll laminator. After-cure was carried out in oven after that, and the copper-clad laminate for flexible printed circuit boards was obtained.
[0044] a comparison -- an example -- 538 -- micrometer -- a polyimide film -- " -- Kapton -- EN -- " -- plating -- copper (8 micrometers) -- forming -- changing -- plating -- a type -- two-layer -- CCL -- " -- meta-- - a royal -- " (product made from Oriental Metallizing) -- the example 5 of a comparison -- having carried out .
[0045] The characterization result of an example 1 - an example 6 and the example 1 of a comparison - the example 4 of a comparison is shown in Table 1. The laminate of an example was excellent in electric insulation and migration-proof nature from Table 1, and all the percent defectives of junction of the rate of a dimensional change were also small 0%. On the other hand, the example 1 of a comparison which is too thick had the high percent defective. Moreover, the examples 2-4 of a comparison which are too large had high percent defectives, such as etching. The example 5 of a comparison is two-layer CCL, and was relatively inferior in migration-proof nature.
[0046]
[Table 1]

表1

		(単位)	実施例1	実施例2	実施例3	実施例4	実施例5	実施例6	比較例1	比較例2	比較例3	比較例4	比較例6
ベース	厚さ	μm	25	38	25	25	25	12.5	25	25	25	25	38
フィルム	熱線膨張係数	ppm/℃	12	15	12	12	12	15	12	12	26	12	15
接着剤	種類	—	接着剤1	接着剤1	接着剤2	接着剤1	接着剤1	接着剤1	接着剤1	接着剤1	接着剤3	接着剤1	なし
	弾性率 at 150℃	Mpa	8.3	8.3	78	8.3	8.3	8.3	8.3	8.3	2.6	8.3	—
	厚さ	μm	10	10	10	10	5	5	18	10	10	10	—
銅箔	厚さ	μm	9	9	9	12	12	12	9	12	9	18	8
	M面Rz	μm	2.3	2.3	2.3	0.67	2.1	1.8	2.3	4.5	3.1	5.0	—
反り		—	○	○	○	○	○	△	○	○	△	○	△
エッチング性(不良率)		%	0	0	0	0	0	0	0	70	0	100	0
絶縁抵抗	R_0	Ω	1.1×10^9	2.1×10^9	1.0×10^9	3.5×10^9	8.9×10^8	1.9×10^9	1.0×10^9	1.9×10^9	8.8×10^7	—	8.8×10^8
	R_{max}/R_0	—	0.85	0.82	0.88	0.98	0.95	0.92	0.90	0.81	0.50	—	0.75
導体	常態	N/cm	8.0	8.9	7.1	6.8	6.9	6.5	9.0	8.3	15.6	9.6	5.8
	無電解銅メッキ後	N/cm	7.6	8.5	6.9	6.5	6.5	6.5	8.2	6.9	3.7	7.3	3.4
引き剥がし	耐薬(2N-HCl)	N/cm	8.0	8.7	6.8	6.7	6.8	6.4	8.2	7.2	14.8	9.6	5.4
強さ	耐薬(2N-NaOH)	N/cm	7.8	8.9	6.9	6.8	6.8	5.7	8.5	7.3	15.2	9.5	5.2
	耐薬(2-プロパノール)	N/cm	7.5	8.7	7.0	6.8	6.8	5.6	8.9	7.9	14.3	9.5	5.5
寸法	MD方向	%	0.01	−0.02	−0.01	0.02	−0.02	0.00	−0.02	−0.01	−0.08	0.03	−0.04
変化率	TD方向	%	0.01	0.03	0.00	0.01	0.00	0.01	0.01	0.02	0.06	0.02	0.03
ACF接合性(不良率)		%	0	0	0	0	0	0	55	10	85	—	0
超音波ボンダ接合性(不良率)		%	0	0	0	0	0	0	20	20	90	—	0

[0047] In the copper-clad laminate of a configuration of being shown in example 7 example 1, the adhesives coat and the lamination were performed in 2 steps using five lots of base film" YUPI REXX S", respectively, and the copper-clad laminate of a total of ten lots was created. About each lot, it is JIS. According to the rate measuring method of a dimensional change of the copper-clad laminate set to C-6471, the rate of a dimensional change after etching and heat treatment (150-degree-C 30 minutes) was measured. A result is shown in Table 2.

[0048] Except making example 8 base film into 25-micrometer "Kapton EN" (heat ray expansion coefficient of 14-15 ppm/degree C), copper-clad laminate 10 lot was created like the example 7, and the rate of a dimensional change was measured.

[0049] Except making example of comparison 6 base film into 25-micrometer "Kapton V" (heat ray expansion coefficient of 25-28 ppm/degree C), copper-clad laminate 10 lot was created like the example 7, and the rate of a dimensional change was measured.

[0050] The measurement result of the rate of a dimensional change of an example 7, an example 8, and the example 6 of a comparison is as being shown in Table 2, and rate of change and standard deviation were small excellent in the example 7 and the example 8. On the other hand, in the example 6 of a comparison using a film with a large heat ray expansion coefficient, rate of change and standard deviation became large.

[0051]

[Table 2]
表2

ロット		1	2	3	4	5	6	7	8	9	10	標準偏差
実施例7	MD	0.01	0.01	0.00	−0.01	−0.03	0.01	−0.03	0.00	0.00	−0.01	0.015
	TD	0.00	0.00	0.01	0.02	0.02	0.01	0.00	−0.01	−0.01	0.02	0.012
実施例8	MD	−0.02	−0.03	−0.04	−0.04	−0.02	0.00	0.00	−0.02	−0.03	−0.03	0.014
	TD	0.01	0.03	0.02	0.02	0.00	0.00	0.02	0.03	0.01	−0.01	0.013
比較例6	MD	−0.04	−0.05	−0.08	0.00	−0.01	−0.02	−0.09	−0.02	−0.06	−0.06	0.030
	TD	0.05	0.02	0.06	−0.01	0.05	0.03	0.07	0.04	0.00	0.03	0.025

寸法変化率測定値:単位%
MD:MD方向(機械方向)
TD:TD方向(MD方向と直角方向)

[0052]
[Effect of the Invention] According to this invention, formation of a fine pattern can offer easily the laminate for high-reliability flexible printed circuit boards which has the electrical property which was easy, and was excellent in dimensional accuracy, and was further excellent, and can apply to highly efficient flexible printed circuit boards including COF.

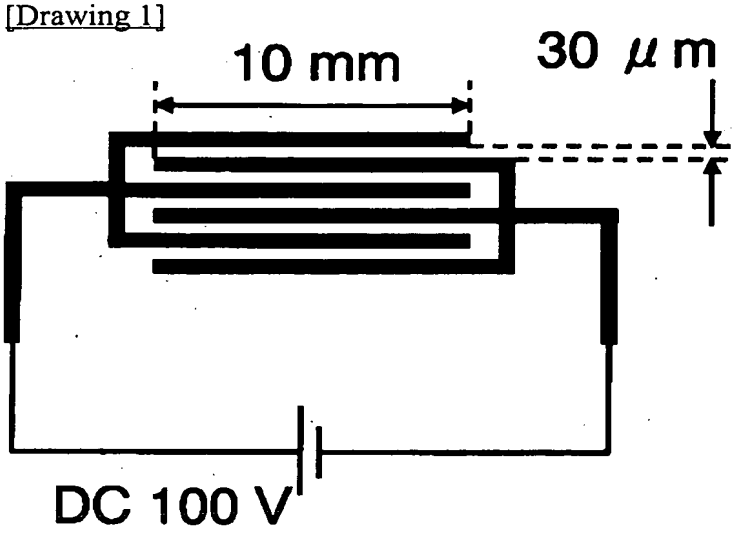
[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]



[Translation done.]